SW-846 FOURTH EDITION METHOD STYLE GUIDE
April 2, 2003

I. PURPOSE OF THIS STYLE GUIDE

This style guide is for use by developers of new methods for SW-846 and editors of existing SW-846 methods. Its use will help assure consistent method format and minimize editorial errors during the development and maintenance of SW-846 Fourth Edition. The guidelines will also help assure high quality conversions to pdfs during method preparation for electronic distribution (e.g., via the Internet).

This guide begins with a discussion of general method format and style guidelines, followed by specific directions for each section of an SW-846 method.

II. GENERAL METHOD FORMAT, CONTENT, AND STYLE GUIDELINES

The instructions to follow are guidelines -- not requirements. Do not follow a guideline if a method-specific situation dictates that a different approach will benefit method use. However, always follow these guidelines in the absence of such a situation or when in doubt about the most appropriate approach.

1. Section content and numbering

- Always follow the section numbering and content guidelines found in Sec. III of this style guide.

- Strive to present typical section information in the same order and level of detail for all methods, as available and applicable. Be especially consistent between methods involving the same analytical technologies.

- Avoid orphaned subsection numbers. For instance, do not precede a paragraph with "3.1.1" if a Sec. 3.1.2 does not follow.

- Avoid exceeding four levels of section numbers (e.g., avoid 9.3.3.3.5) by considering other approaches to organizing and presenting the information.

2. Grammar, style, and usage

- Except when otherwise specified in this guide, follow the ACS Style Guide with regard to grammar, style, and usage. The style adopted by ACS is for the most part taken from established authoritative sources, such as the GPO Style Manual and The Chicago Manual of Style; and in addition deals specifically with style and usage related to chemistry.

- Use an active voice whenever possible.

3. Chemical nomenclature

- Follow IUPAC rules for chemical nomenclature except when deviations (e.g., use of common names or other nomenclature typically used by the RCRA regulations) is more appropriate. The American Chemical Society's (ACS) Style Guide is recommended as a reference on chemical nomenclature.

4. Software

- Submit all method documents in WordPerfect (must be compatible with version 9.0).

- If you cannot use WordPerfect, then at least use a word processing software that can be easily converted to WordPerfect with minimal conversion errors.

5. Font

- Use Arial 11 point.

6. Margins

- Set the right and left margins at a spacing of one inch (1"). Set the top and bottom margins at one half (½) inch.

7. Justification

- Use left justification for method text alignment unless otherwise specified in this style guide.

8. Tabs and indents

- Do not tab major sections (e.g., 1.0, 2.0, etc.). Subsections (e.g., 1.1, 2.2, etc.) are first line tabbed. All subsequent subdivisions (e.g., 1.1.1, 2.2.2.2, etc.) are tabbed or indented to show their relative sub-categorization.

- Use the following left tab settings:

0.0", 0.375", 0.875", 1.5", 2.25", and 3.13"

For example, using up to three levels:

9.0 QUALITY CONTROL

9.1 Quality control related to the use of a test kit for RDX or HMX analysis.

9.1.1 Follow the manufacturer's instructions for the quality control procedures specific to the test kit being used.

- The above tab settings accommodate up to five levels of numbered subsections, e.g., through 9.5.1.2.3. (However, please avoid exceeding four levels, see item no. 1 above.) If the section number includes a lot of double digits (e.g., 11.11.3.11), adjust the tab settings as necessary to allow sufficient spacing between the section number and section text.

- Use **tabs** to wrap the text of the second line of a section to the left of the first line.

For example:

1.1 This method provides procedures for the gas chromatographic (GC) determination of organophosphorus (OP) compounds.

- Use **indents** when the text of the second line is not intended to wrap to the left of the first line.

- For third level and higher subsections, use indents to move the subsection number away from the left margin, followed by one tab immediately before the subsection number, and another tab after the number, and before the text. The use of the indent keeps the second line from wrapping all the way back to the left margin. For example:

    11.3.2 Take two drops of methyl blue and add it to a 50-mL vessel containing 5 mL of NAOH and fill to volume with sample aliquot. Stir the mixture briskly.

9. Spacing

- Triple space (two blank lines) before each major section (1.0, 2.0, etc.). Double space between other sections. Single space within sections, as appropriate (sometimes double spacing within a section or paragraph is necessary to accommodate "notes," "warnings," equations, or other information.

- Use two spaces after periods and colons in sentences.

- Spacing in tables can vary, as long as the content is readable.

10. Capitalization

- Put major section titles in all capital letters (e.g., 9.0 QUALITY CONTROL). Capitalize only the first letter of the titles of other subsections. For example:

    9.0 QUALITY CONTROL

        9.1 Surrogate recovery

11. Use of notes, warnings, and cautions

- Use the following conventions regarding the content and purpose of any notes, warnings, or cautions:

    WARNING: Provides information to prevent personal injury.

    CAUTION: Provides information to prevent damage to equipment or other significant occurrences to be avoided during application of the method.

    NOTE: Provides useful tips and background relating to the current topic.

- As illustrated above, present each of the above headings in all capital letters, underlined, with a colon, then an indent (with a "custom" tab setting of two spaces after the colon), such that the text after the colon is aligned even to the left.

- As necessary, modify the document section tabs to accommodate the indent for a "NOTE," "WARNING," or "CAUTION" . Restore the default method tab after the note, warning, or caution.

- Indent notes, warnings, cautions only as far as the left of the preceding text; or NOT as far as the section number is tabbed, but to the point where the text wraps to the left. For example:

6.2 Drying column - 20 mm ID Pyrex® chromatographic column with Pyrex® glass wool at bottom and a PTFE stopcock.

NOTE: Fritted glass discs are difficult to decontaminate after highly contaminated extracts have been passed through. Columns without frits may be purchased. Use a small pad of Pyrex® glass wool to retain the adsorbent. Prewash the glass wool pad with 50 mL of acetone followed by 50 mL of elution solvent prior to packing the column with adsorbent.

12. Keeping Text Together and Page breaks

- To avoid the separation of section headings (including subsection headings, such as "9.1 Surrogate recovery") from the section text at a page break, use "keep text together" features provided by the WordPerfect software, such as "Block Protect" or "Conditional End of Page."

- Never use hard page breaks in the text portion of the method.

- Always use hard page breaks between the last page of text (i.e., after the sentence under the title of Sec. 17.0) and the first table and all other subsequent pages to separate tables and figures.

13. Page numbering

- Position page numbers at the bottom center of the page as part of the footer. Begin the page number with the appropriate method number (including any letter suffix), followed by a hyphen, and then the page number starting with the number one (1). Place one space on either side of the hyphen. Use the automatic number sequencing in the software to accomplish this task. For example:

3562 - 1

14. Units

- Use the System Internationale (SI) units as the standard units of measurement.

- For the unit "micro", use the Greek symbol notation. This symbol (**:**) can be located under the Greek character set (number 8,25) in WordPerfect.

- Use the following standard types of units:

  mg/L (not :g/mL)
  ng/:L (not :g/mL)

- When using a number and a unit as an adjective to modify a noun, put a hyphen between the number and unit. However, do not insert a hyphen if the number and unit are instead used as a noun. For example: "Add 10 mL of distilled water to a 25-mL beaker, weigh a 10-g portion of the field blank sample and add 100 :L of the solution containing the nine internal standards diluted with 1.0 mL of acetone."

15. Equations

- Triple space between section text and a equation (bottom and top). Do not place the equations any closer to the text. Otherwise, pdf conversions compress the document material and may move the equations so close to the text that the equation cannot be fully

read. Center the equations and set the height and width of the equation boxes large enough to view the whole equation when printed. Do not italicize equations. In WP 8 or 9, this requires that the equation be written as a "function," which is accomplished by beginning the equation with "func" and enclosing it all in curved brackets. Use the equation editor. For example:

Bottom line of preceding text here.

$$\% \text{ dry weight} = \frac{\text{g of dry sample}}{\text{g of sample}} \times 100$$

Top line of following text here.

- Be consistent with equation formats.

- Use units in the equation that are consistent with the method procedure and sample matrix.

- Define all equation variables.

- Do not number equations in a method.

16. Acronyms

- Prior to the first use of an acronym in a method, spell out the term it represents and then include the acronym in parentheses. For example:

  supercritical fluid extraction (SFE)

  Afterwards, use just the acronym, as appropriate.

- A proper noun is the name of a particular person (e.g., Dr. Paul Jones), place (e.g., New York) or thing (e.g., Table 1). Capitalize only proper nouns within a sentence (unless of course you are quoting a document title which includes the use of initial capitalization). Use of an acronym does not turn its full word into a proper noun. In other words, the conventional use of capitals in an acronym does not mean that capitals must be used in the full word -- unless the word is already a proper noun. For example:

  This is correct:

  "The use of supercritical fluid extraction (SFE) . . . "

  This is incorrect, because "supercritical fluid extraction" **is not** a proper noun):

  "The use of Supercritical Fluid Extraction (SFE) . . . "

  However, this is correct, because "Office of Solid Waste" **is** a proper noun:

  "The Office of Solid Waste (OSW)..."

17. Method and SW-846 manual references in the text of a method

- In general, do not refer to the method itself by its method number within its own text -- instead refer to it only as "this method."

- Usually, do not refer in the method text to "SW-846," as though the method is a separate document and not an integral part of the SW-846 manual. Instead, refer to "this manual." Exceptions apply in certain boilerplate statements which address use of the manual in general.

- Only use method numbers with their letter suffixes (e.g., 3500A) in the method number of the method title and page number. Do not include method number suffixes in the text of the methods, unless the method reference is part of a document title quote. For example, state "See Method 3510," even if the latest version of this method is "3510A." Otherwise, the text of many methods might have to be updated to reflect new suffixes each time a referenced method is revised. (See Sec. III below for information on the purpose of letter suffixes in method numbers.)

18. Section references in the text

- When referring to an SW-846 method section, capitalize and abbreviate the term section, for example: Sec. 1.5

- When referencing sections in other methods, only go to the first level, e.g., 2.0, because the subsection content and numbering of any method may change in future updates. Also, for similar reasons, do not reference specific chapter sections, only reference the chapter number (exceptions to this may apply due to a boilerplate referral).

19. Document references in the text

- Cite references in the text by directing the reader to a specific reference listed in the references section (Sec. 16.0), using such phrases as "refer to" or "see". For example:

  For complete method performance data, see Reference 2.

20. Use of the terms "must (shall), should and may" and "required"

- Avoid use of the term "shall" -- use "must" instead as appropriate.

- In general, follow the NACE method Style Manual for guidance regarding the proper use of the terms "must, should, and may." Specifically:

  Use "must" to indicate mandatory requirements -- when not following the instruction will cause the method to not work.

  Use "should" to indicate that which is considered good and is recommended but is not absolutely mandatory. In this case, for instance, changes may be made to improve method performance or to meet certain project-specific needs.

  Use "may" to indicate that which is considered optional (and which of course might depend on method performance goals and project-specific needs).

- As appropriate, use the term "designated" instead of "required", e.g., "designated" volume instead of "required" volume. In SW-846 methods, the term "required" is most often used

in the context of something necessary to properly perform a particular function or step of the procedure, and is not typically used to indicate a regulatory requirement. The term "regulatory" or "regulation" usually appears with the word "required" if its use addresses a regulatory requirement. However, minimizing the use of the word "required" in the methods will help dispel this confusion.

21. Terms to use or avoid (exceptions may apply, dependent on sentence content)

Correct: "described" steps
Incorrect: "specified" steps

Correct: "designated" volume
Incorrect: "specified" volume

Correct: "professional judgement" of the . . .
Incorrect: "discretion" of the . . .

Correct: "appropriate" calibration compound
Incorrect: "acceptable" calibration . . .

22. Detection or Quantitation Limits

- In general, do not include or mention MDLs or EQLs, in either the text or tables. If necessary or useful, only include a generic description of anticipated method sensitivity for the matrix. The focus should be on actual measured performance, based on spike recoveries in the matrix of concern or of method performance on a certified reference material of the appropriate matrix and within the appropriate calibration range for the application. Also, clearly note that the information is provided as guidance only, and that such limits are highly-matrix dependent and not always achievable. In some cases, such as in the immunoassay methods, the values quoted as "MDLs" are real measured values and thus should be left in the method with a change in the terminology.

23. Footnotes

- Only use footnotes in the tables, avoid using them in the method text.

24. Other miscellaneous style guidelines

- **Negative ionic charge symbol** -- Use the WordPerfect "Math/Scientific" symbol "6,38" (G), not a hyphen superscript.

- **Dot in chemical formulas** -- Use the WordPerfect "Typographical" symbol "4,3" (•). Some of the other symbols commonly used are too large or too small.

- **Temperature** -- For degrees, use the WordPerfect "Math/Scientific" symbol "6,36" (°). As directed by the ACS Style Guide, put a space right after the number and keep the degree symbol and "C" together. For example: 10 °C

- **Trade names for materials** -- Avoid use of trade names if something more generic is also appropriate. For example, use "polytetrafluoroethylene (PTFE) in place of "Teflon."

- **Measurement abbreviations for liter** -- Designate liter using an upper case "L" and milliliter as "mL".

- **Plurals of measurement abbreviations** -- Do not use plurals for abbreviated units of measure. For example: 50 mg *not* 50 mgs

- **Quotation marks** -- Use straight quotation marks (e.g., " *or* ') instead of smart quotes. That style is better suited to the serif-free Arial font.

- **En dash with numbered items** -- Use en dash (typed as a hyphen) with three or more numbered items, with no spaces before or after the en dash. For example: 20-30 mL, References 3-5 . . .

- **Apostrophes** -- Do not use an apostrophe in plurals of chemical name acronyms. For example:

  Correct: PCBs
  Incorrect: PCB's

III. SECTION-SPECIFIC GUIDELINES

This section of the style guide provides general guidance regarding method numbers, method titles, and the content of the 17 sections of SW-846 methods. (See Attachment A for a one-page summary listing of the 17 sections of SW-846 methods.) It also provides general boilerplate sections that should appear in most SW-846 methods -- when appropriate. Please note that the directions in this section are guidelines and not rules. For example, other instructional "boilerplate" phrases, or revisions to those that appear in this guide, may be more appropriate to individual methods or groups of methods (e.g., based on similar technologies or steps used by the methods). This style guide does not include the many examples of such information. Therefore, developers of new methods should review recently published and technically similar methods for additional insight regarding section content, and consult with EPA for direction.

METHOD NUMBER AND TITLE

- Present the title in capital letters, underlined and centered.

- Use succinct method titles. The most important item, usually the analytes of concern, should be mentioned first. For example, begin with the analytes of concern followed by the matrix and the technology used by the method. An exception to that example, however, might be "SCREENING OF VOAs IN SOIL," where the fact that it is a screening method is the most important item.

- Do not begin the title with "ANALYSIS OF" or "DETERMINATION OF."

- Place the method number two lines above the title. (Method numbers are assigned by EPA based on the type of technology and analytes. See Attachment B to this style guide for the guidelines used by EPA.)

For example:

METHOD 8275

SEMIVOLATILE ORGANIC COMPOUNDS (PAHs AND PCBs)
IN SOILS/SLUDGES AND SOLID WASTES USING
THERMAL EXTRACTION/GAS CHROMATOGRAPHY/MASS SPECTROMETY (TE/GC/MS)

- Any method included for the first time in SW-846 Fourth Edition will be "Revision 0" of that method. A method formally increases in revision status each time it is revised and published as a final update to an SW-846 edition. During development of a new revision, the method revision number is increased once and that revision number is used when the method is final. Therefore, a method revision number does not increase as a result of each review within the technical work group, or as it goes from a "draft" or "proposed" status to a "final" update status. It only increases with each final publication, and its revision number is the same at "proposal" or "draft" as it will be at final.

- Letter suffixes (e.g., A, B, C) to a method number identify the revision status of the method. New methods, i.e., Revision 0 methods, do not have a letter suffix. A suffix of "A" in a method number indicates Revision 1 (the method has been revised once and distributed as final). A suffix of "B" indicates Revision 2, etc.

Title Boilerplate:

Place the following paragraph between the title and Sec. 1.0 of all methods:

SW-846 is not an analytical training manual. Therefore, method directions assume that they will be followed by individuals formally trained in at least the basic principles of chemical analysis and in the use of the subject technology. See Chapter Two for more information on the qualification and training expectations for the use of the methods in this manual.

1.0 SCOPE AND APPLICATION

- In the first section, describe the purpose and technology of the method, including what types of analytes or attributes are being measured (e.g., this method is a colorimetric screening procedure that may be used to determine . . . in soil samples). Mention all applicable matrices.

- As appropriate, tabulate a list of analytes (put in a table even if only one analyte) validated by the method, by common name, with any common abbreviations, and the Chemical Abstract Service Registry number. Only include those analytes regulated under RCRA in this first table. Precede the table with this statement: The following RCRA compounds (or analytes) have been determined by this method:" Do not say "can be" determined . . . For cross-method consistency, the header title for the target analytes column should be "Analytes", although this is not critical.

- Create a separate table for any other possible analytes (e.g., those not adequately validated for analysis using the subject method or those validated which are not RCRA analytes), set up exactly as in the previous table of analytes, but with a qualifying statement.

- Indicate any important relationships to other SW-846 methods, as applicable.

- Specify method limitations (e.g., what the method will not accomplish that the analyst may be looking for).

- As noted earlier in this style guide, do not address or include method detection or estimated quantitation limit discussions or data in Sec. 1.0 or anywhere else in the method. If necessary or useful, only include a generic description of method sensitivity, and clearly note that the information is provided as guidance only, and that such limits are highly-matrix dependent and not always achievable.

- In preparation or extraction methods, note that other solvent systems may be employed, and that for any solvent system used, including those mentioned in the method, one needs to demonstrate adequate performance for the analytes of interest. (Also note this in Sec. 7.0 of the method.)

- Include any other method application information that would be particularly useful to the chemist during method selection (including, for example, particularly critical safety information, with a reference to Sec. 5.0 for details).

- Include boilerplate statements (see below) regarding intended method flexibility and required uses and regarding experience of analysts.

Sec. 1.0 boilerplate regarding method flexibility and required uses:

Generally in all methods, include the next two paragraphs as the next to the last subsection under Sec. 1.0. The first sentence of the first paragraph may not be necessary for some methods (e.g., those not involving the use of base laboratory methods), and revise the "e.g." as necessary based on the subject method:

1.X Prior to employing this method, analysts are advised to consult the base method for each type of procedure that may be employed in the overall analysis (e.g., Methods 3500, 3600, 5000, and 8000) for additional information on quality control procedures, development of QC acceptance criteria, calculations, and general guidance. Analysts also should consult the disclaimer statement at the front of the manual and the information in Chapter Two for guidance on the intended flexibility in the choice of methods, apparatus, materials, reagents, and supplies, and on the responsibilities of the analyst for demonstrating that the techniques employed are appropriate for the analytes of interest, in the matrix of interest, and at the levels of concern.

In addition, analysts and data users are advised that, except where explicitly specified in a regulation, the use of SW-846 methods is *not* mandatory in response to Federal testing requirements. The information contained in this method is provided by EPA as guidance to be used by the analyst and the regulated community in making judgments necessary to generate results that meet the data quality objectives for the intended application.

Sec. 1.0 boilerplate regarding analyst experience:

Include this boilerplate paragraph as the last subsection under Sec. 1.0. The first example of this paragraph is a generic approach and the second examples illustrates a more specific approach. Example 2 should be the preferred one when specific instrumentation is included in the method, e.g., GC, ICAP, etc. For some sample prep methods, e.g., Soxhlet, acid digestion, Example 1 is more appropriate.

Example 1:

1.X Use of this method is restricted to use by, or under supervision of, appropriately experienced and trained personnel <or use the term "analysts">. Each analyst must demonstrate the ability to generate acceptable results with this method. This method is intended to be a supplement to -- but it is NOT intended to be a substitute for -- formal training of an analyst in the basic principles of its technology.

Example 2:

1.X Use of this method is restricted to use by, or under supervision of, personnel <or use the term "analysts"> appropriately experienced and trained in the use of <add method technology here>. Each analyst must demonstrate the ability to generate acceptable results with this method. This method is intended to be a supplement to -- but it is NOT intended to be a substitute for -- formal training of an analyst in the basic principles of <add method technology here>.

2.0 SUMMARY OF METHOD

- Provide a brief summary of the method's major steps -- in the detail necessary to best prepare the analyst regarding what will be necessary during method application.

- Make this section complete enough for the analyst to anticipate possible interferences or other application problems.

- Do not include details of exact volumes or weights, etc.

3.0 DEFINITIONS

- There will be a separate chapter or appendix in the Fourth Edition for definitions of terms and acronyms. Therefore, include a boilerplate section (see below) in each Fourth Edition method which refers the method user to that part of the manual for definitions. Do not add this boilerplate to methods published by EPA (e.g., posted on the web) before completion of the Fourth Edition because the definition chapter does not exist in the Third Edition.

- This section can also include definitions of terms and acronyms particularly relevant to the method and those which may not be familiar to the reader. However, do not include particularly extensive lists of method-specific definitions (i.e., more than three definitions) -- instead include those definitions in a glossary (as a method appendix) at the end of the method and refer to it in this section.

Sec. 3.0 boilerplate:

For referring to another location in the Fourth Edition for definitions (this may change at a later date to be more specific about the location of the terms (e.g., chapter number):

3.X Refer to the SW-846 chapter of terms and acronyms for potentially applicable definitions.

4.0 INTERFERENCES

- Discuss known and potential problems and interferences that could affect method performance or an evaluation of the results.

- As appropriate, describe procedures that may be employed to prevent or minimize the problems. If such procedures are already included in Sec. 11.0 (Procedure), a reference to these subsections should be included in this section.

- If appropriate, include the boilerplate regarding demonstrating that materials used during analysis are free of interferants (see below).

Sec. 4.0 boilerplate:

Include this boilerplate in most methods, when appropriate to method application. Do not include it in field test kit methods or similar applications.

4.1 Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and/or interferences to sample analysis. All these materials must be demonstrated to be free from interferences under the conditions of the analysis by analyzing method blanks. Specific selection of reagents and purification of solvents by distillation in all-glass systems may be necessary. Refer to each method for specific guidance on quality control procedures and to the chapter text <you may include the specific chapter number> for general guidance on the cleaning of glassware.

5.0 SAFETY

- Discuss personnel health and safety issues specific to performance of the method and beyond the scope of routine laboratory practices. This includes information regarding specific toxicity of target analytes and reagents, special precautions to avoid harm, and any special protective equipment required for performing the method.

- Safety warnings may also occur in other sections of the method, for example, in the procedure at the step of concern. However, you must repeat in Sec. 5.0 all safety concerns found in any other section of the method.

- Add the appropriate boilerplate statement (see below) regarding safety issues not directly addressed by the method.

Sec. 5.0 boilerplate if there are safety warnings:

Include as the first section if one or more specific safety warnings will be in Sec. 5.0:

5.1 This method does not address all safety issues associated with its use. The laboratory <or replace "laboratory" with "user" if the method is not a laboratory method> is responsible for maintaining a safe work environment and a current awareness file of OSHA regulations regarding the safe handling of the chemicals listed in this method. A reference file of material safety data sheets (MSDSs) should be available to all personnel involved in these analyses.

Sec. 5.0 boilerplate if there are no safety warnings:

There are no significant safety issues that are specific or unique to this method. However, SW-846 methods do not purport to address all safety issues associated with their use. The laboratory <or replace "laboratory" with "user" if the method is not a laboratory method> is responsible for maintaining a safe work environment and a current awareness file of OSHA regulations regarding the safe handling of the chemicals listed in this method. A reference file of material safety data sheets (MSDSs) should be available to all personnel involved in these analyses.

6.0 EQUIPMENT AND SUPPLIES

- List method-specific equipment and supplies (those other than reagents and standards), without mentioning a specific vendor whenever possible. Include the phrase "or equivalent" as appropriate when vendor-specific instrumentations or supplies are listed. If specific equipment is necessary based on method studies, clearly state what equipment and supplies were tested. If necessary, include sufficient information for locating and purchasing the correct equipment.

  Common laboratory apparatus, e.g., beakers, flasks, stirring bars, graduated cylinders, etc., should not be mentioned, unless there is a specific need for one with an unusual or non-standard characteristic, e.g., a specific chemical-resistant coating for a stirring bar, tinted glass flasks, Class A graduated cylinders, etc. All other apparatus should be mentioned in this section, e.g., pH meter, hot plate stirrer, analytical balance, etc. Generally, mention only the more expensive and unique equipment.

- If appropriate (see note before boilerplate), add the boilerplate (below) regarding how the mention of trade names is for illustrative purposes only (if such names are given in the method).

- If appropriate, also include the boilerplate (below) regarding glassware for solvent recovery, edited as appropriate to the specific method.

- Do not include more sensitivity specifications (significant figures) than necessary. For instance, a balance capable of weighing to "0.0001 g" is too sensitive of a specification for the weighing of 10-g samples. A specification of 0.01 g may be more appropriate.

Sec. 6.0 boilerplate regarding trade names:

Include this boilerplate in most methods, depending on the application and whether trade names for equipment are mentioned. However, do not include this boilerplate in immunoassay field test kit methods or similar applications that depend on use of a specific commercial product.

6.1 The mention of trade names or commercial products in this manual is for illustrative purposes only, and does not constitute an EPA endorsement or exclusive recommendation for use. The products and instrument settings cited in SW-846 methods represent those products and settings used during method development or subsequently evaluated by the Agency. Glassware, reagents, supplies, equipment, and settings other than those listed in this manual may be employed provided that method performance appropriate for the intended application has been demonstrated and documented.

Sec. 6.0 boilerplate regarding a listed solvent recovery system:

Include this boilerplate when appropriate:

NOTE: This glassware is recommended for the purpose of solvent recovery during the concentration procedures requiring the use of <identify the technology here, e.g., "Kuderna-Danish evaporative concentrators">. Incorporation of this apparatus may be required by Federal, State or local municipality regulations that govern air emissions of volatile organics. EPA recommends the incorporation of this type of reclamation system as a method to implement an emissions reduction program. Solvent recovery is a means to conform with waste minimization and pollution prevention initiatives.

7.0 REAGENTS AND STANDARDS

- Provide sufficient detail on necessary grades, the concentration, and the preparation of all reagents and standards to allow the work to be duplicated. Do not include lengthy discussions on common procedures.

  Exception regarding information on preparation of standard: If a standard must be prepared when it is about to be used (e.g., as in Method 8151), the description of standard preparation can appear at that location in the method (e.g., in Sec. 11), and a reference to that section should appear here in Sec. 7.0 as appropriate.

- List each chemical as follows: chemical name, concentration in parenthesis, and the formula. For example: Sodium hydroxide (2M), NaOH

- Be consistent with the standard or reagent name throughout the method (and the manual as possible), and include all standards and reagents mentioned by the method in any section.

- Keep a 1:1 correlation between the information in this section and the others, e.g., if the procedure calls for both 2N and IN H_2SO_4, then include in this section both 2N and 1N H_2SO_4.

- As necessary, include specific information regarding the storage of the reagent or standard.

- List reagents before standards, particularly if the standards are to be prepared from the reagents. List the standards in descending order based on which are made from which, i.e., list the stock standards before the dilution standards. As compatible with these condition, also match the listing order with the first appearance of the chemical in the procedure.

- Include boilerplate instructions (see below) regarding the reagent grade of chemicals and references to water, when appropriate. This boilerplate may not be appropriate for some methods. (In old methods, replace references to "ASTM Type II" water with "reagent." Also, because of the boilerplate for this section, reagents throughout the method need not be referred to as "analytical-grade.")

  [Note: These instructions may change in the future upon development of the separate chapter of definitions. In that case, there may just be a link from this method section to the definition for reagent water. Global adjustments cam be made to all methods after

completion of the new definitions chapter of the manual. The definitions for reagent water will be different for organic and inorganic methods.]

- In preparation or extraction methods, note that other solvent systems may be employed, provided that adequate performance can be demonstrated for the analytes of interest with any solvent employed, whether or not it is listed in the method.

Sec. 7.0 boilerplate:

Include the following paragraph when appropriate as the first section; this boilerplate may not be appropriate for some methods, such as field test kits:

7.1 Reagent grade chemicals must be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

8.0 SAMPLE COLLECTION, PRESERVATION, AND STORAGE

- Provide any method-specific information on sample collection, preservation, shipment, and handling or storage. In general, this section should not deal with general field sampling information, nor refer to such guidance. However, include field sampling components in those methods for which such procedures are an integral part of the method, e.g., Method 5035/Appendix A.

- When appropriate, add a boilerplate referral (see below) to the method chapter for additional, or for any, guidance on sampling procedures that may be particular to the methods contained in that chapter.

Sec. 8.0 boilerplate:

Add this boilerplate when appropriate (i.e., if such guidance exists somewhere in the chapter):

See the introductory material to this chapter, <put title of chapter here>.

9.0 QUALITY CONTROL

- Describe method-specific quality control measures.

- Do not include general QC information that is redundant to that already contained in Chapter One.

- Do not include calibration information in Sec. 9.0.

- As appropriate for a laboratory method, add the first boilerplate referral (see below) to the SW-846 Chapter One for guidance on additional quality assurance and quality control protocols. When this boilerplate is not appropriate (e.g., for a field test kit method), then add the second boilerplate.

Sec. 9.0 boilerplate for laboratory methods:

Include this section in methods used in a laboratory. In the first sentence of this boilerplate section, add "additional" before "guidance" if the method provides other QC information in the QC section.

9.1 Refer to Chapter One for guidance on quality assurance (QA) and quality control (QC) protocols. When inconsistencies exist between QC guidelines, method-specific QC criteria take precedence over both technique-specific criteria and those criteria given in Chapter One, and technique-specific QC criteria take precedence over the criteria in Chapter One. Any effort involving the collection of analytical data should include development of a structured and systematic planning document, such as a Quality Assurance Project Plan (QAPP) or a Sampling and Analysis Plan (SAP), which translates project objectives and specifications into directions for those that will implement the project and assess the results. Each laboratory should maintain a formal quality assurance program. The laboratory should also maintain records to document the quality of the data generated. All data sheets and quality control data should be maintained for reference or inspection.

Sec. 9.0 boilerplate for other methods (e.g., field test kits):

9.1 Refer to Chapter One for guidance on quality assurance (QA) and quality control (QC) protocols. When inconsistencies exist between QC guidelines, method-specific QC criteria take precedence over both technique-specific criteria and those criteria given in Chapter One, and technique-specific QC criteria take precedence over the criteria in Chapter One. Any effort involving the collection of analytical data should include development of a structured and systematic planning document, such as a Quality Assurance Project Plan (QAPP) or a Sampling and Analysis Plan (SAP), which translates project objectives and specifications into directions for those that will implement the project and assess the results.

10.0 CALIBRATION AND STANDARDIZATION

- If preferred, calibration and standardization information need not be separated from the procedure information in Sec. 11 and put into this section. Instead, simply refer to the text on calibration and standardization found in Sec. 11, Procedure. (At a minimum, this referral approach must be used for the organic methods.) Include the first boilerplate below.

- Use the second boilerplate below for methods to which calibration information does not apply.

- If calibration information will be included in Sec. 10, provide the information listed below. Keep instrument operating conditions in the procedure section (Sec. 11).

    - As appropriate, describe initial calibration procedures, with details on how to do them.

    - Indicate acceptance limits for the calibration, or refer back to a base method if appropriate.

    - Provide guidance on what to do if the relevant performance criteria are not met.

    - As appropriate, describe calibration verification. At the least, include an indication of verification frequency.

Sec. 10.0 boilerplate when calibration information is kept in the procedure section:

See Sec 11.X for calibration and standardization information.

Sec. 10.0 boilerplate for methods with no applicable calibration information, e.g., sample preparative or cleanup methods:

There are no calibration or standardization steps directly associated with this procedure.

11.0 PROCEDURE

- Provide detailed step-by-step instructions for using the method. Write in an active voice, as much as possible. Include a description of sample processing and instrumental or physical analysis steps. Include those steps that are essential to the procedure, and avoid unnecessary restrictive instructions.

- Strive for cross-method consistency in the presentation of procedures, especially for similar technologies.

12.0 DATA ANALYSIS AND CALCULATIONS

- Describe quantitative and qualitative information for deriving final sample results from typical instrumental data. Otherwise, include a reference to a base method or to Sec. 11.0 for the information (e.g., to avoid a disruption of the procedural flow).

- Include any of the various boilerplates provided below, as appropriate.

Sec. 12.0 boilerplate for referral to Sec. 11:

12.1 See Sec. 11.X for information regarding data analysis and calculations.

Sec. 12.0 boilerplate regarding units:

12.X Results must be reported in units commensurate with their intended use and all dilutions must be taken into account when computing final results.

Sec. 12.0 boilerplate for methods like the 4XXX series that rely heavily on manufacturer's kits/instructions:

See the manufacturer’s instructions regarding data analysis and data calculations.

Sec. 12.0 boilerplate for methods with no data calculation steps (e.g., preparative methods):

There are no data analysis and calculation steps directly associated with this procedure. Follow the directions given in the determinative method.

Sec. 12.0 boilerplate for referral to a base method:

See Method 8000 (or whatever is the appropriate base method) for information regarding data analysis and calculations.

13.0 METHOD PERFORMANCE

- Provide summaries regarding sources of performance data examples, with brief descriptions of the studies and the results. Also, include references to the data sources and performance data found in tables of the method. (Important: List all of these data sources in the reference section (Sec. 16.0) and provide complete copies to EPA for the central method file.)

- Clearly indicate that the performance data are examples of what might be achieved and that the data are not intended to be used as acceptance criteria (also add the word "example" to referenced table titles, as appropriate).

- Do not address or include method detection limit discussions or refer to tables of such data anywhere in the method. If necessary or useful, only include a generic description of anticipated method sensitivity for the matrix. The focus should be on spike recovery performance and the calibration range. Also, clearly note that the information is provided as guidance only, and that such limits are highly-matrix dependent and not always achievable. In some cases such as in the immunoassay methods, the values quoted as "MDLs" are real measured values and thus should be left in the method with a change in the terminology.

- Include the boilerplates below, as appropriate.

Sec. 13.0 boilerplate applicable to most methods:

13.1 Performance data and related information are provided in SW-846 methods only as examples and guidance. The data do not represent required performance goals for users of the methods. Instead, performance goals should be developed on a project-specific basis, and the laboratory should establish in-house QC performance criteria for the application of this method.

Sec. 13.0 boilerplate for preparative methods without performance information:

13.X Refer to the determinative method for performance data examples and guidance.

Sec. 13.0 boilerplate for field test kits:

13.1 Performance data and related information are provided by the manufacturer in the package insert.

Sec. 13.0 boilerplate applicable to other methods without performance data (rare):

13.X Performance data examples and guidance for this method currently are not available.

14.0 POLLUTION PREVENTION

- At a minimum, add the boilerplate below regarding EPA's stance on pollution prevention.

- Include any method-specific aspects that minimize or prevent pollution.

Sec. 14.0 boilerplate:

Include as the first two subsections:

14.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity and/or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operations. The EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the Agency recommends recycling as the next best option.

14.2 For information about pollution prevention that may be applicable to laboratories and research institutions consult *Less is Better: Laboratory Chemical Management for Waste Reduction* available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th St., N.W. Washington, D.C. 20036.

15.0 WASTE MANAGEMENT

- At a minimum, add the boilerplate below regarding EPA's stance on laboratory waste management.

- If necessary, also include any method-specific aspects of laboratory waste management.

Sec. 15.0 boilerplate:

Include as the first paragraph or subsection (if more subsections follow):

The Environmental Protection Agency requires that laboratory waste management practices be conducted consistent with all applicable rules and regulations. The Agency urges laboratories to protect the air, water, and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any sewer discharge permits and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For further information on waste management, consult *The Waste Management Manual for Laboratory Personnel* available from the American Chemical Society at the address listed in Sec. 14.2.

16.0 REFERENCES

- List those method source documents (specifically those documents used as a text source during method writing and development), and publications that document method performance and are directly referenced by the method. This list should not include general educational references regarding the method technology or its analytes, or other such documentation that was not used during method development. If such indirect references are included in the method, list them as a final subsection to Sec. 13, Method Performance, preceded by the statement: "The following documents may provide additional guidance and insight on the performance and application of this method technology: . ."

- List the author(s)'s name(s) first, using the first initial then middle initial separated by a period, followed by the surname and a comma. The title follows the comma. Articles, journals, reports, and studies are enclosed in quotation marks, while books are not. A comma follows the title within the quotes, then publisher, research institute, or other publishing body's information is listed along with project number, and document date, separated by commas, where applicable. Journal names are written in italics (not applicable to the example given below.) For example:

  T.F. Jenkins, P.G. Thorne and M. E. Walsh, "Field Screening Method for TNT and RDX in Groundwater," US Army Cold Regions Research and Engineering Laboratory, Special Report, Hanover, New Hampshire 03755, 1994.

- All references must have dates. If a report is "in progress" or not yet published, a version must be dated and referenced as such -- and included in the method file. Do not simply put "in progress" or "to be published."

17.0 TABLES, DIAGRAMS, FLOW CHARTS, AND VALIDATION DATA

- Directly following the Sec. 17.0 title, add the following brief boilerplate (revised as appropriate): The following pages contain the tables and figures referenced by this method.

- Follow the above statement by a hard page break, followed in turn by the tables and then the figures (with hard page breaks as appropriate). Always place tables before figures. In the event of a "natural" occurrence of a soft page break between tables or figures, replace it with a hard page break

- Include only those tables and figures which were mentioned and briefly described in the method. Place the tables or figures within Sec. 17.0 in the order referenced by the text. Do not include tables or figures within the method at other locations. (The only exceptions to including tables in the text are the table of analytes and the table of additional analytes that may appear in Sec. 1.0. However, those tables are not numbered.)

- Diagrams or figures should only include new or unusual equipment or aspects of the method.

- Completely identify sources of all figures and tabulated data. Do not include copyrighted figures or data, unless permission has been obtained (submit the record of permission to EPA for inclusion in the central method file). Include complete source citations in Sec. 16.0 of the method for the figures and table data .

- Do not include flow diagrams of procedure steps in the Fourth Edition methods.

Table formatting

- Except in instances where clarity is compromised, omit table grid lines. Use a double line across the top and bottom of the table. Use a single line below the header row with the table. Identify the source of the information using "Data taken from Reference __" as a footnote to the table with proper document number from the references section.

For example:

Element	10 mL HNO3 Digest	9 mL HNO3 + 3 mL HCL Digest	Total Analyte Concentration
Cd	3.40 ± 0.34	3.62 ± 0.17	3.45 ± 0.22
Ni	45.5 ± 5.9	42.2 ± 3.2	44.1 ± 3.0

Data taken from Reference 12**.**

Table titles

- Number tables in a sequential manner. Center the title of each table at the top of the page, separated by a blank line below the top label of table number. Present the title in all capital letters. For example:

TABLE 1

CHROMATOGRAPHIC CONDITIONS FOR
1,2-DIBROMOETHANE (EDB) AND 1,2-DIBROMO-3-CHLOROPROPANE (DBCP)

- For large tables, the font for the contents of the table (not the title) may be a size smaller than "11" if necessary. However, keep the material readable.

Figure titles

- Designate figures in a sequential manner. Begin with "FIGURE 1" centered at the top of the page, skip a line, then provide the title of the figure. Present the title in all capital letters. For example:

FIGURE 1

CALIBRATION CURVE FROM A COMPETITIVE IMMUNOASSAY

Figure formatting

- Place “Figure taken from Reference __" identification as a footnote to the figure with proper reference number included.

- If you are a method developer submitting a method to EPA for consideration as an SW-846 method, do not embed figures in the text. Provide separate electronic copies and clear prints of the figures. The Agency will import the figures into the method documents in the format currently used for SW-846 methods.

ATTACHMENT A

ORDER OF PARTS AND SECTIONS IN FOURTH EDITION SW-846 METHODS

METHOD NUMBER

TITLE

1.0 SCOPE AND APPLICATION

2.0 SUMMARY OF METHOD

3.0 DEFINITIONS

4.0 INTERFERENCES

5.0 SAFETY

6.0 EQUIPMENT AND SUPPLIES

7.0 REAGENT AND STANDARDS

8.0 SAMPLE COLLECTION, PRESERVATION, AND STORAGE

9.0 QUALITY CONTROL

10.0 CALIBRATION AND STANDARDIZATION

11.0 PROCEDURE

12.0 DATA ANALYSIS AND CALCULATIONS

13.0 METHOD PREFORMANCE

14.0 POLLUTION PREVENTION

15.0 WASTE MANAGEMENT

16.0 REFERENCES

17.0 TABLES, DIAGRAMS, FLOW CHARTS, AND VALIDATION DATA

APPENDICES (e.g., GLOSSARY)

ATTACHMENT B

NUMBERING SYSTEM FOR SW-846 METHODS

Method No.	Method Type
0000 Series	Sampling Methods
001x	Air Sampling - Stack - Volatile Organics
002x	Air Sampling - Stack - Semivolatile Organics
003x	Air Sampling - Stack - Volatile Organics
004x	Air Sampling - Stack - Volatile Organics
005x	Air Sampling - Stack - Acid Gases
006x	Air Sampling - Stack - Metals
01xx	Air Sampling - Ambient
1000 Series	Certain Characteristics Methods (Also see 9XXX, e.g., for pH method)
10xx	Ignitability
11xx	Corrosivity
13xx	Extraction/Leaching Procedures
3000 Series	Sample Preparation Methods
30xx	Metals/Inorganics
35xx	Organic Extraction or Dilution
36xx	Extract Cleanup
38xx	Organic Screening
4000 Series	Immunoassay Methods
40xx	Organic Analytes (Screening)
45xx	Metals/Inorganics (Screening)
46xx	Organic Analytes (Assay)
5000 Series	Volatile Organics/Combustion Preparative Methods
50xx	Volatile Organic Preparation/Sample Introduction
505x	Combustion Preparative Methods
6000 Series	Metals/Inorganic Determinative Methods
60xx	ICP Determinative
62xx	X-ray Determinative
65xx	Electrochemical Determinative
7000 Series	Individual Metals/Inorganic Determinative Methods (Primarily AA with Some Other Techniques)
8000 Series	Organic Determinative Methods
80xx	GC Determinative/Various Detectors
81xx	GC Determinative/Various Detectors
82xx	GC Determinative/Mass Spec Detectors
83xx	HPLC Determinative/Various Detectors
832x	HPLC Determinative/Mass Spec Detectors
84xx	IR Determinative
85xx	UV/Vis Determinative

Method No.	Method Type
9000 Series	Miscellaneous Analytes and Tests Methods
901x	Cyanide
902x	Organic Halogen
903x	Sulfur Containing Anions
904x	pH
905x	Specific Conductance/Ion Chromatography (Anions) Determinative
906x	Nonspecific Organics (TOC, Phenolics)
907x	Oil and Grease/Chlorine in Used Oil
908x	Cation Exchange Capacity
909x	Land Disposal Restrictions Test
910x	Saturated Hydraulic Conductivity, Saturated Leachate Conductivity and Intrinsic Permeability
913x	Microbiological
92xx	Anions - Nitrate/Chloride
921x	Anions Determinative - Ion-Selective Electrode
93xx	Radionuclides
931x	Radioactivity